



Marine line fish research programme

SANCOR

Programme developed by an *ad hoc* working group for
the South African National Committee for Oceanographic Research

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PREFACE

At the 28th meeting of EXCOR (the Executive Committee of the South African National Committee for Oceanographic Research) held on 18 October 1977, it was recognized that the need for information on marine line fish resources (commercial and recreational) around the South African coast was becoming more and more important. A Working Group (see the Annexure) was therefore appointed to investigate what SANCOR's role should be in marine line fish research and to propose action.

The Working Group met on 10 and 11 May 1978 and prepared a draft document reviewing the information available and research work currently underway and stating the research requirements. The Working Group recommended however, that a workshop should be organized where the draft document could be finalized in consultation with the active workers in the field.

The workshop took place at the University of Port Elizabeth on 20 and 21 June 1978 (for participation see the Annexure). This document emanates from it and has subsequently been approved by EXCOR.

The document contains the proposals of the marine line fish research community on the research most urgently required. It must however be realized that it reflects the situation as it existed in 1978 and that it will of necessity have to be adapted as the situation changes and as more information becomes available.

ABSTRACT

This report outlines the framework for a marine line fish programme under the aegis of the South African National Committee for Oceanographic Research (SANCOR).

An attempt is made to assess the state of knowledge about South African marine line fisheries. Certain common problem areas are recognized, and the different components of the resource are considered with regard to available knowledge and current research. Important gaps in existing knowledge and research requirements are identified according to type of fishery and geographic area.

OPSOMMING

Hierdie verslag bevat die raamwerk vir 'n mariene lynvisprogram onder die beskerming van die Suid-Afrikaanse Nasionale Komitee vir Oseanografiese Navorsing (SANKON).

Daar word gepoog om die huidige stand van kennis oor Suid-Afrikaanse mariene lynvisserye te bepaal. Sekere probleemareas word uitgeken en die verskillende komponente van die hulpbronne word beskou in terme van beskikbare kennis en huidige navorsing. Belangrike leemtes in bestaande kennis en navorsingsbehoefte word geïdentifiseer volgens die soort vissery en geografiese gebied.

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INTRODUCTION

Although marine recreational line fisheries do not usually produce direct financial benefits comparable to those of commercial fisheries, their economic implications nevertheless can be enormous. The reason lies in their importance to coastal regions dependent on a tourist trade and to industries such as small craft, outboard motors and fishing tackle manufacture. In California it has been estimated that anglers spend 5 times more than the value of their catch and while in Florida the commercial catch was valued at 39 million dollars in 1970, the overall value of the recreational fishery was valued at 200 million dollars.

No overall figures are available at present as to how many people participate in marine line fishing in South Africa. The figures must, however, be substantial when one considers that up to 20 000 people can, for example, be accommodated at the angling resorts St Lucia, Cape Vidal and Sordwana Bay during a single weekend. Another indication of the intensive participation in recreational line fishing in South Africa is the estimate that in total ski-boat fishermen spend some 2,6 million fishing hours at sea per year.

It is recognized widely that marine line fish resources along South African coasts are subjected to ever increasing pressure from various sources such as commercial fishing, recreational angling, spearfishing and the degradation of the marine environment. In recent years reports indicating serious deterioration in marine angling of various kinds have become more numerous, and lately some of these reports have been substantiated by research findings in Natal. It is felt that certain or all of the pressures mentioned above are now probably affecting an assortment of marine line fish stocks significantly, and consequently there is considered to be a very real and urgent need for the conservation and rational management of these resources.

The objective of the Cooperative National Oceanographic Programme is to gain scientific knowledge required inter alia to facilitate the efficient exploration, exploitation and conservation of marine resources and the judicious development, management and conservation of the coastal zone. The objective of the marine line fish research programme which has been developed within this framework, is specifically to provide scientific information about this valuable component of the marine food web to aid the development of effective management strategies.

THE DOCUMENT

In the document an attempt is made to assess the state of knowledge about the South African marine line fisheries by firstly identifying certain common problem areas and secondly by considering their different components separately after a breakdown according to type of fishery and geographical area. For each of these components:

- the available knowledge and current research are summarized;
- important gaps in existing knowledge are identified; and
- research requirements are stated.

Four types of line fishing were identified and are considered within three separate geographical areas, thereby creating 12 separate components. The elements of these components are:

Types of Fishing

- . Estuarine angling
- . Rock and surf angling
- . Open sea line fishing
- . Underwater fishing

Geographical Areas

- . Natal coast
- . Cape east and south coasts (to Cape Point)
- . Cape west coast

In a few instances some of these components are combined. Because they are relevant to all facets of fish biology, available knowledge and current work in the field of taxonomy and research requirements on juveniles are summarized in separate sections.

In the summaries of available knowledge and current research no attempt is made to list the organizations that contributed information or who are currently involved. No references are cited as they will be included in a forthcoming publication by Darracott and Brown (National Scientific Programmes Report - in preparation).

RESEARCH APPROACH

Irrespective of where marine line fish occur or how they are taken, certain basic information is a common requirement for their management. This includes:

- Catch statistics (suitable for calculation of catch per unit effort and, ideally, total catch and total effort) to allow stock assessment analyses and the recognition of trends in specific fisheries. These statistics have to be compatible to enable comparison of results from different areas. There are two sources of information - from experimental catches and from fishermen. Perhaps the major problem in line fish research is to design a system capable of obtaining reliable data on a routine basis from the latter.
- Life history studies with emphasis on reproductive patterns, growth rates, attainment of sexual maturity, feeding, habitat requirements and mortality rates. Practical steps to ensure standardization of methods have been instituted.
- Identification of populations of similar species along different parts of the coast and the determination of the inter-relationships between them. An important example is the annual sardine run along the East Cape and Natal coasts and other components of the temperate water fish fauna associated with these pelagic fish.

For all of the above, the standardization of methods (as far as possible) along the whole coast is highly desirable. Close inter-institutional communication is essential.

EXISTING KNOWLEDGE OF LINE FISH AND RESEARCH REQUIREMENTS

ESTUARINE ANGLING

For the purposes of this document the estuarine environment is understood to include river mouths, lagoons and lakes subject to the influence of sea water.

Estuaries represent an important component of the marine environment because of their aesthetic and recreational value, their role as nursery and feeding areas for marine fish, and because they provide a habitat for typically estuarine species. They therefore constitute a valuable protein resource in their own right. Estuaries are particularly vulnerable to development, over-exploitation and degradation through processes such as siltation, diversion of fresh water inflow and pollution.

As far as pollution is concerned it is noted that the Marine Pollution Monitoring Programme has identified certain estuaries as impact areas and that these estuaries are to be monitored for chemical pollution on a regular basis (trace metals, nutrients, salinity, temperature and biotic components).

Natal Estuaries

Early research on the estuarine fish fauna of Natal was limited to qualitative surveys and resulted in the publication of comprehensive species lists. This work was expanded during the years 1969-1974 to life history studies relevant to management. Research was conducted on adult and juvenile populations in the estuarine and marine environments. This provided data on the species and length composition of both estuarine and marine components, their areas of occurrence, seasonal abundance, months and areas of spawning, seasonality and lengths at which juveniles migrate into estuaries, their environmental preferences, growth rates, periods spent in estuaries and feeding preferences. From this it became apparent that in general the estuarine fish fauna comprises species which are primarily marine during the adult phase and primarily estuarine during the juvenile phase of their lives. Thus although the adults that do enter estuaries are significant from an angling point of view, the real biological significance of estuaries lies in the fact that they provide nursery areas for juveniles. Evidence from the east coast suggests that the seasons and areas of adult spawning favour the immigration of juveniles into estuaries before the summer months of maximum river outflow. From this research it was concluded that a priority of management should be to protect the fish nursery function of South African estuaries. Current research is involved with the environmental requirements of juveniles, trophic relationships within estuarine fish fauna, adaptations to changing environments and limited population studies.

Catches at St Lucia are being monitored through counts of the total number of anglers and recording of their catches. Experimental gill netting is being undertaken to correlate the abundance of fish with anglers' catches and to investigate the possible disturbance of intense angling on the migration of fish through the narrow mouth into the lake system.

Regular surveys of the fish populations of the Richards Bay sanctuary and harbour are being conducted to monitor changes following harbour construction and the dredging of a new mouth to the sea.

A recently initiated study of the Umhlanga Lagoon is aimed at estimating population size and density of the species present in this small intermittently closed estuary.

A comprehensive review of all available knowledge on Natal's estuarine environment, which will include information on the fish fauna, is currently being compiled.

Research Requirements

Because of the severe impact of township development, agriculture, industry and road and rail construction on the ecology of many of Natal's estuaries, research aimed at prevention of further degradation and where possible rehabilitation should receive priority over stock assessment studies. Here more detailed knowledge of the natural mechanisms of seasonal opening and closing of estuaries in relation to the breeding cycle of fishes and of habitat requirements within the estuarine environment at different stages in the life cycle of the fishes, is considered to be particularly important.

Of the 73 estuaries in Natal for example only six have received detailed attention. It is considered desirable to evaluate the fish nursery potential of estuarine systems, including the many smaller ones.

Cape Estuaries

Early research consisted of qualitative surveys and resulted in a fair knowledge of the composition of fish fauna present in the larger estuarine systems in the Cape Province. In more recent years the biology of a few selected species such as stumpnoses Rhabdosargus spp, white steenbras Lithognathus lithognathus, mullet Mugil spp and Liza spp and the spotted grunter Pomadasys commersonni has been studied.

Current research involves the following:

- An ecological study of the mullets Myxus capensis and Mugil cephalus in the upper reaches of some Eastern Cape estuaries.
- A quantitative and ecological survey of larval fishes in the Sundays, Swartkops and Kromme estuaries.

- Studies on the seasonal abundance, population structure, distribution and diversity of larval, juvenile and adult fish in the Sundays, Swartkops and Kromme estuaries. Where possible attention is given to the energetics of the most abundant species.
- Studies on the biology and population dynamics of estuarine angling fish and the analysis of all existing angling catch statistics in eastern Cape estuaries.
- Biology of juvenile fishes in Cape south coast estuaries with special reference to the Knysna and Swartvlei estuaries.
- Ecological studies of Gilchristella and Hepsetia in the Wilderness lakes area.
- A study of foodwebs in the Wilderness lakes area with special reference to the food habits and trophic positions of Gilchristella and Hepsetia.
- A system which is receiving special attention is Saldanha/Langebaan in relation to harbour development. Its fish fauna which is typical of a marine embayment with strong tidal water exchange, is well known.
- A coordinated survey of all existing knowledge of Cape estuaries is being undertaken inter alia to identify gaps in knowledge.

Research Requirements

- An assessment of the economic and recreational value of estuarine angling. Included here is the collection and analysis of catch statistics to recognize annual and long-term trends in abundance.
- The distribution and abundance of fish in all Cape estuaries and the influence of the closing and opening of river mouths on estuarine fish populations.
- The impact of commercial fishing on estuarine angling fishes.
- The continuation of research in estuaries on larval, juvenile and adult fish and an evaluation of the estuaries as nursery grounds for line fish species.
- Autecological studies on fish species which have not been studied previously (e.g. reproduction, food habits, population dynamics).
- In Langebaan regular monitoring of the fish fauna is desirable to contribute to the assessment of the effects of the development in Saldanha Bay and the adequacy of the conservation measures associated with the marine reserve.

ROCK AND SURF ANGLING

The fish fauna in the rock and surf zone represents the most popular component of angling fishes exploited in South Africa. The fauna is diverse and traditionally well known to anglers, but in spite of this the majority of species have not been subjected to intensive biological investigation. Fish in the rock and surf zone are vulnerable to heavy exploitation, to changes in the intertidal and subtidal biota as a result of bait collection, pollution and general biological degradation of their environment. While they are exploited heavily both for recreation and for augmenting food supplies (or for sale), and while most anglers recognize that there might be declining trends in their abundance, there is a tendency to resist research out of fear that research results might lead to the imposition of fishing restrictions.

It should be borne in mind that certain of the fish caught in the rock and surf zone may be resident in specific areas and furthermore that ecological conditions vary greatly along various parts of the coast. While research methods should be standardized as far as possible, differences in environmental conditions along various parts of the coast might make direct comparison of the results difficult. Under these circumstances close collaboration between research workers is of the greatest importance. Little is known about the distributional patterns of juvenile stages of the fish of the rock and surf zone and more information must be gathered about the dispersion of eggs and larvae and of migrational patterns of adults. Of basic importance along the whole coast is the collection of reliable catch statistics and their analysis coupled to life history studies.

Natal Coast

Rock and surf angling is extremely popular in Natal. A conservative estimate indicates that 60 000 Natal residents fish in the rock and surf zone each year and this does not include the large influx of holiday makers. Fairly intensive research has been carried out in the rock and surf zone. This has included analysis of the competition records of the Natal Coast Anglers Union over a period of 22 years. This work has been augmented by intensive biological investigations over the past four years concentrating on five species - piggy Pomadasys olivaceum, stonebream Neoscorpis lithophilus, blacktail Diplodus sargus, karanteen Sarpa salpa and banded galjoen Coracinus multifasciatus.

Determination of breeding seasons, sex ratios, variations in seasonal abundance and growth rates is being undertaken. Special attention is devoted to the feeding preferences of these five and other species and this information is integrated with the food network studies on a typical Natal reef. Stomach contents are analysed on a seasonal basis and each food item is then quantitatively evaluated. Additionally quantitative beach patrols are regularly undertaken in order to assess the angling potential and catch composition of the inshore reef fish. A study of one of the most important angling species - the elf Pomatomus saltatrix - has been completed and provides a disturbing indication of declining abundance.

The elasmobranch fauna of Natal has received special attention in terms of taxonomic, biological and ecological research. This work has included intensive tagging programmes.

Research Requirements

The most important future research need is centred around continued monitoring and analysis of catch statistics. Attention must also be given to studies of eggs, larvae and juveniles. Tagging programmes must be expanded to migratory species, including sharks, so as to cast more light onto the interrelationship of stocks along various parts of the coast. A paucity of knowledge also exists in respect of the identity and biology of species occurring sub-littorally as well as in conjunction with the coral reefs along the northern Zululand coastline. Present indications that small, unspectacular fish such as piggies (pinkies) and blennies are of great importance as a food resource for the larger fish occurring in the rock and surf zone, should also be followed up. Where marine reserves are declared, certain areas set aside for the purpose, should be regularly monitored.

Cape East and South Coasts

More elaborate research on fishes occurring in the rock and surf zone in this area was recently initiated but is not so far advanced as in Natal. Most progress to date has been made in the taxonomic field. However, several aspects of rock and surf angling are being investigated at present and these are :

Biology, ecology and population structure

- Data on the line fishes at St Croix Island in Algoa Bay have been collected over a two year period. These data were obtained from local angling clubs which visited the island once a month. All fish catches were analysed for length, mass, feeding, reproduction and growth. Biological data are available for 18 species, although the data are not equally comprehensive for all the species caught, due to the infrequent catches of several species. Those species in the list indicated with an asterisk represent the ones more frequently caught and for which extensive data are available. The species are:

Koester Acanthistius sebastoides, yellowbelly rockcod Epinephelus guaza, elf Pomatomus saltatrix, galjoen Coracinus capensis, fransmadame Boopsoidea inornata, santer* Cheimerius nufar, dageraad* Chrysoblephus cristiceps, red stumpnose Chrysoblephus gibbiceps, roman Chrysoblephus laticeps, zebra* Diplodus cervinus, blacktail* Diplodus sargus, sandsteenbras Lithognathus mormyrus, bronze bream Pachymetopon grande, scotsman Polysteganus praeorbitalis, cape stumpnose Rhabdosargus holubi, strepie Sarpa salpa, musselcracker* Sparodon durbanensis, steentjie Spondylisoma emarginatum.

Catch per unit effort could thus be calculated for all species caught, but is also broken down for individual species. Seasonal trends in the availability of various species were recognized.

- The monitoring and data collection of rock and surf angling catches along the eastern Cape coast were to date not very successful and little data are thus available. The reason is that although club and interclub competitions are regularly held, man-power to monitor these catches which are often made over a large area, is not always available.
- At the beginning of 1978 a project was started on the feeding ecology and biology of small elasmobranchs (Rhinobatus annulatus, Dasyatis pastinacus, Myliobatus aquilla, Mustelus spp and Torpedo fuscomaculata) off sandy beaches. Biological aspects such as reproduction, growth, and migration in addition to their feeding ecology, are investigated. Data are obtained from organized angling club catches and from beach seine netting. Information on all other elasmobranchs caught in Algoa Bay are also being collected.
- A project to determine the flow of energy through high energy sandy beaches has recently been initiated. One aspect of this project entails a study of the feeding ecology and seasonal availability of teleosts off sandy beaches. The beach seine technique is used to obtain these data and consequently various juvenile and immature angling fish species are caught. Biological data on the smaller size categories of the more important angling fish species are thus collected to supplement the data from angler's catches, which mainly consist of large fish.

Catch statistics

Catch statistics from ten rock and surf angling clubs in Algoa Bay and St Francis Bay, dating back to approximately 1968, have been obtained and some preliminary analyses have been made. Catch data have also been obtained from several clubs as far north as East London and westwards to Plettenberg Bay. Unfortunately no catch effort data are available but some indication of trends in the fishery can nevertheless be obtained. More recently, catch and catch effort data from fishing competitions have become available. These data will be analysed by the same computer programme used by ORI and which was developed at the Sea Fisheries Branch.

Research Requirements

- Most important is the monitoring and analysis of line fishing catches and catch statistics. As mentioned above, this aspect of rock and surf line fishing research is at present conducted at a low intensity. These data are essential for a better understanding of the biology and distribution of the line fish populations, as well as the population structure and dynamics of the various stocks.

- Studies of the migrations of line fishes. A tagging programme is thus essential. Attention must also be given to the sea-estuary exchange of larvae and juveniles and other smaller fish species.
- Determination of breeding grounds and the identification and distribution of larvae and juveniles of rock and surf fishes.
- Where marine reserves are declared, certain areas set aside for the purpose should be regularly monitored.

Cape West Coast

Because of the present low intensity of rock and surf fishing along the west coast, a high priority is not given to research on fishes in the rock and surf zone of this area at this stage. This situation can be reviewed when more results have become available from the research carried out along the east and south coasts.

OPEN SEA LINE FISHING

In terms of both mass and numbers the greatest quantity of line fish is caught from small craft. There are a number of problems related to line boat fishing under the category 'sport':

- The distinction between recreational and commercial line fishing is difficult because many amateur line fishermen sell their catches. This situation is complicated by the relatively high investments in boats and motors. Fishermen wishing to obtain a return on this investment are reluctant to submit catch returns as they feel that these might restrict their activities.
- While organized ski-boat clubs might be prepared to cooperate, there are many non-affiliated ski-boat fishermen who will not. This problem might be alleviated through the findings of the Commission of Enquiry into Control over Small Craft currently being conducted by the Department of Transport.
- A problem may lie in the overlap between the same fish exploited by boats and rock and surf fishermen. This applies particularly to the south and west coasts.
- Because migratory game fish and resident reef fish require different management techniques, standardization of control measures for line boat fishing is not easy.

Natal Coast

Over the past four years the analysis of catch statistics submitted by those members of the ski-boat fraternity who are willing to cooperate has been undertaken. Catch return forms have been printed and circulated to individual clubs and log books are kept at launching sites.

Field officers periodically record the catch and effort of ski-boat operators in this area, and scientific staff also constantly log catch and effort data. At the entrance to each controlled launching site an additional log book records the total angling effort expended. Concurrent with this work is the biological analysis of game fish catches landed by ski-boat fishermen. It is becoming apparent that the majority of game fish are not permanent residents in Natal waters but appear to migrate from tropical and temperate waters to the north and south respectively.

Many of the game fish examined were sexually immature and few would seem to spawn in this region. Stomach contents are being quantitatively analysed although preliminary findings suggest that many species feed opportunistically. Parasites have been examined in detail in the hope that they might prove useful as biological tags. Material is also being collected to assist in age determinations and to evaluate growth rates of the most important species.

Research Requirements

- The continuation of monitoring through the analysis of catch statistics on a better organized basis and the completion of biological studies.
- An intensive tagging programme of migratory species and reef fish should be initiated.
- A glaring gap in information exists in regard to deep reef fish which are an important food resource and which in former years formed the basis of a commercial line boat fishery. Because of increasing paucity of deep reef fish this commercial fishery has declined considerably over the past ten years. Some species such as the seventy-four which were investigated some 12 years ago have now virtually disappeared and other species are apparently following the same pattern. Basic research on life histories and collection and analysis of catch statistics is required. The cooperation of the operators of ski-boats, super skis, strikers, line boats, and spear fishermen will be required for this investigation. It should be carried out concurrently with the research on fish of the rock and surf zone and should not replace the latter.

Cape East and South Coasts

Line boat fishing is an important activity in this area in terms of both ski-boats and diesel powered boats. Line boat fishing is more commercially orientated here than in Natal but relatively little research has been conducted on the resource apart from investigation of a number of species of commercial importance. Recreational line fish as such have only received incidental attention and in general certain species were selected for special investigation. Aspects of reproduction and growth were investigated for the bronze bream Pachymetopon grande the carpenter Argyrozona argyrozona and the snoek Thyrsites atun.

Furthermore the larval development of the snoek was studied while some experimental fishing aimed towards the establishment of an industry based on tuna stocks off the coast was conducted.

Recently, coupled with the allocation of a permit for commercial exploitation of yellowtail Seriola lalandi, preliminary stock assessment studies were conducted with a view to establishing a commercial quota. This involved the analysis of historical catch and effort data obtained from fish dealers along the coast.

Current research activities include a continuation of stock assessment studies as well as biological studies on yellowtail. Tagging and the collection of non-line fishing commercial catch returns form part of this programme. Commercial landings of snoek and tuna are also being monitored from catch returns and, in the case of tuna that are landed by foreign vessels, also in relation to size frequency, on request of ICCAT (International Commission for the Convention of Atlantic Tunas).

Research based at Port Elizabeth is aimed at investigating the species composition of both game and reef fish caught by boat line fishermen. The biology including size at sexual maturity, spawning and seasonality of the various species is being investigated. The feeding ecology will receive particular attention by utilizing the squid beak and fish otolith reference collections housed at the Port Elizabeth Museum. Stock identification using parasites as biological tags is being undertaken. Catch statistics are being collected and it is hoped to broaden this information input as it is presently confined to one locality in Port Elizabeth. This programme is complementary to research being done on sport fish at ORI and it is noteworthy that species such as the yellowfin tunny Thunnus albacares, the skipjack Katsuwonus pelamis and the elf Pomatomus saltatrix are encountered in both regions. Furthermore certain typically cold water species such as the yellowtail Seriola lalandi are frequently encountered in winter and consequently a further bridge between research currently underway at the Sea Fisheries Branch is being provided. Preliminary data indicate that the main species are yellowtail Seriola lalandi, elf Pomatomus saltatrix, kob Argyrosomus hololepidotus, skipjack Katsuwonus pelamis and yellowfin tuna Thunnus albacares.

Research Requirements

- Intensification of the Algoa Bay programme and its extension northwards and westwards as this becomes feasible.
- Continuation of life history research on commercial species with increasing emphasis on deep reef fish which are a valuable resource exploited by both commercial line boats and ski-boats over a wide area. Of great importance is the collection of catch statistics for game and reef species.
- Tagging of migratory and reef species.

Cape West Coast

The distinction between recreational and commercial line fishing for the two most important species, snoek and hottentot, is not clear. However, non-commercial line fishing for these species is at such a low level in comparison with commercial fishing that it is of little significance. The biology of the two species is well known. Although accurate catch statistics are not available for these species they do not appear to be over exploited. Nevertheless the collection of catch statistics of all species is desirable.

UNDERWATER FISHING

Resources which are exploited by spear fishermen are generally the same as those taken from the shore or from boats. However, some species are more vulnerable to spear fishermen, and certain species can only be captured by spear guns. This means that spear fishing can cause changes in the fish composition in areas which are easily accessible to underwater fishermen and this aspect warrants special study. Two other aspects related to diving are of importance :

- Those species which can only be captured by spear fishing are, in general, not well known and merit attention.
- Where marine reserves are declared, underwater observation represents a valuable method of comparison with exploited areas.

Other research requirements are complementary to those which have been covered in previous sections of this document.

Spear fishing is the only facet of fishing in which bag limits are enforced in the Cape, whilst in Natal control is by means of licencing, size limits and protected species.

For purposes of this document, underwater activities for the collection of rock lobsters, molluscs and private aquarium specimens are not included, but the importance of the effect of these activities should not be overlooked. Because of the nature of underwater fishing it is not necessary to consider the different parts of the coast separately. In Natal a responsible attitude by spear fishermen has been very encouraging and of much assistance in research.

TAXONOMIC RESEARCH

Numerous workers in the past have contributed to the considerable knowledge of the taxonomy and geographical distribution of the South African marine fishes. This culminated in JLB Smith's Sea fishes of southern Africa, first published in 1949. It is used extensively and considered throughout the scientific world as one of the finest books of its kind ever produced. The wearing out of the type and thirty years of research both here and in other parts of the world has made it imperative that the book be revised. This is now in progress.

Little change is likely in the names of the angling fishes, especially those that are endemic, but recent use of Scuba gear for collecting has made it possible to sample the fishes of the sublittoral region and collect those not susceptible to capture by trawl or bait. Some new species and new records have already been documented and much will be learnt of vertical distribution.

An intensive integrated egg and larval programme designed for qualitative and quantitative studies on commercially important species along the western and southwestern Cape coast was initiated by the Sea Fisheries Branch towards the end of 1977. The programme covers the area approximately between Lamberts Bay and Cape Infanta. Monthly surveys involve not only egg and larval sampling, but also cater for physical, chemical and biological environmental studies. Results from this study may be of great importance in relation to marine line fish studies.

RESEARCH REQUIREMENTS ON JUVENILE LINE FISH

There is a dearth of knowledge on the identification and distribution of the larval and juvenile stages of the majority of important line fish. Many of these are believed to grow up in offshore nursery areas but their location remains obscure and research effort is required to investigate this important matter. The programme envisaged by the Sea Fisheries Branch (see 'Taxonomic Research' above) will provide a valuable input of data and expertise but there is a need to expand this to include line fish species along the east Coast.

In addition to the identification and taxonomy of larvae, juveniles in their first year should be quantitatively sampled.

MARINE LINE FISH RESEARCH - ANNEXURE

MEMBERSHIP OF SANCOR WORKING GROUP ON MARINE LINE FISH RESEARCH:

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